

PROJECT NUMBER: 2501
PROJECT TITLE: Smoke Chemistry
PROJECT LEADER: R. Comes
PERIOD COVERED: October 1988

I. SIDESTREAM SMOKE

A. Objective: Conduct studies on sidestream smoke including: development of methods for collection and analysis of sidestream gas phase and semivolatiles; visibility determinations; analysis of selected materials relating to sidestream odor and irritation; development of potential proprietary products.

B. Status: (1) Methods development for analysis of sidestream smoke components continues. (2) Construction of instrumentation to monitor visibility of sidestream smoke has been ongoing. Visibility measurements are run as required. (3) Studies have proceeded in the design and optimization of an apparatus for CORESTA sidestream measurements. Selected samples have been run in support of this effort.

C. Results: (1) The Tekmar unit used for analysis of sidestream smoke has been disconnected from the gc/ms. Direct injection of concentrated solvent samples of sidestream smoke has been investigated while building and developing a valve-controlled heart-cutting apparatus. Compounds can now be transferred from the primary to the secondary column. Operational problems still need to be addressed. A sidestream smoking chamber with a trap that can accommodate smoke from thirty cigarettes has been fabricated for investigation of components present in very low concentration. (2) The 8-port visibility apparatus has been placed in operation and a series of Monitor 25 cigarettes run as a system test and to establish operating procedures. Problems relating to the "pooling" and "curling" of smoke at the outer edges of the hood have been addressed. (3) Results of CI data from 1R4F cigarettes run on the "Enclosed Fishtail" CORESTA smoking machine at sidestream flow rates of 2, 3 and 4 liters/min have been obtained and reported. An additional sample in the low density rod program has been obtained and smoked on the CORESTA apparatus. Results support the conclusions discussed in the Sept. 88 Monthly Report. Some core/periphery studies have been initiated to determine the effect of replacement (modification) of these areas in a cigarette on the mainstream/sidestream deliveries. Surprisingly, an increase in nicotine delivery to both mainstream and sidestream is observed in the cigarettes with a center core of "pith" as compared to the delivery for a normal 2R1 cigarette.

D. Plans: (1) The total Tekmar system will be set-up after optimization of the heart-cutting procedure is completed. The analysis of the compounds present in very low concentration in sidestream smoke will commence shortly. (2) Additional modifications to the 8-port visibility apparatus will be made and smoking runs for system check-out will continue. (3) Core/periphery studies will proceed utilizing other materials to attempt to modify mainstream/sidestream delivery ratios.

II. MISCELLANEOUS

A. Nicotine analyses have been carried out in support of Analytical Research and the ART project. A comparison of the internal standards n-butylornicotine and isoquinoline (standard used in method #E-86) in gc nicotine analyses gave excellent agreement. Efforts will continue for improvement of accuracy and precision of the analysis, determination of factors affecting quantitation in actual samples and extension of the procedure to other alkaloids.

B. Samples of pre-ART filler and ART processed filler treated by vacuum drying are being investigated by gc to determine if differences are detectable. This work is in support of the attempts to alleviate the "spotting" problems with ART filler.

C. Investigations of the RJR Premier cigarette have been carried out. An initial study utilizing ^{14}C -nicotine applied to the flavor beads and separately to the tobacco filler showed a 6% transfer from the beads and only a 0.2% transfer to mainstream from the filler. Recovery of applied ^{14}C -nicotine was only 50-55%. These investigations are continuing.

GC and GC/MS evaluation of both the flavor beads and smoke have been initiated. Some bead flavor components have been identified and many smoke constituents determined. Additional identifications are ongoing as different collection and elution techniques are utilized.

D. Several GC and GC/MS analyses were conducted in support of Division needs. The new Finnigan SSQ-70 mass spectrometer has been received, installed and is currently being tested using various ionization techniques.